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PHASE II AND III IN DEVELOPMENT OF A C&P TOXIC CHEMICAL DATABASE

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Canada

INLAND WATERS DIRECTORATE
ATLANTIC REGION
WATER QUALITY BRANCH
MONCTON, NEW BRUNSWICK

PHASE II AND III IN DEVELOPMENT OF A C&P TOXIC CHEMICAL DATABASE

IWD-AR-WQB-90-161

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Think Recycling!

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EXECUTIVE SUMMARY

The ability to access information for use in decision making is a well recognized need within the context of managerial sciences. A similar process must exist in order to make effective technical decisions pertaining to environmental resources. Databases are the principle vehicle by which scientists and resource managers store and access environmental information. This document presents a follow up to a previous report entitled "Phase I in the Development of a C&P Regional Toxic Chemical Database", by providing a description of the work undertaken in 1990 and more importantly, presenting a prospectus for an integrated database structure and information dissemination mechanism.

A database structure is proposed that can meet IWD program needs, the needs of the Canadian Environmental Protection Act (CEPA) Parts I and II, as well as having value added benefits in the areas of State of the Environment Reporting (SOE) and the Environmental Assessment and Review Process (EARP).

ABSTRACT

Environmental data from EP surveillance reports along with other relevant data holdings were entered into the toxic chemical database. A proposed database structure and dissemination mechanism are presented to promote discussion and distribution of environmental databases.

SOMMAIRE

Des données environnementales, la plupart tirées de rapports de contrôle du Service de la protection de l'environnement, ont été entrées dans la base de données de produits chimiques toxiques. Une structure pour bases de données et un mécanisme de dissémination furent proposés. Ils sont présentés dans ce rapport afin de favoriser la discussion et la distribution de bases de données environnementales.

INTRODUCTION

The amount of environmental data available to scientists and resource managers has grown significantly over the years. This growth is due in part to the importance of the environment to the Canadian public, the growth of the environmental studies field, and the development of more sophisticated environmental measurement techniques. On a regional basis there exists a large body of environmental information (Spencer and Neumeyer 1989). The databases noted by Spencer and Neumeyer (1989) represent a regional compilation from various federal, provincial and academic sources that range from hard copy formats through to electronically stored data. There was a perceived need within the Water Quality Branch to be able to better access various data sets in order to better describe factors which may influence water quality.

This need was compatible with the needs of Environmental Protection, which was interested in having more convenient access to the large amount of existing water quality and surveillance data. As a consequence, under the aegis of the Regional Toxic Chemical Committee and with the support of the Regional Director General's office, a pilot study was undertaken to input data on abandoned land disposal sites. The report that ensued, "Phase I in the Development of a C&P Regional Toxic Chemical Database" (O'Neill *et al*. 1989), detailed the rationale behind the development of a toxic chemical database and proposed three recommendations:

1) that the waste site data be accessible across the services.

2) that future C&P monitoring and sampling locations be geo-referenced.

3) that resources be allocated so other C&P report data could be included in the Atlantic Region database.

The first recommendation has been partially attained in that the data contained in the database have been given wide distribution within the region in hard copy format. Service-wide electronic access, though technologically possible, has not been implemented due in part to the limitations of hardware and software development.

The second recommendation has also been accepted. The importance of geo-referencing (latitude and longitude) has been recognized as a requirement for defining accurate sampling locations and for any geographic information system (GIS) applications.

The third recommendation has also been followed up in 1990 with the entry to the toxic chemical database of chemical data extracted from several Environmental Protection surveillance reports.

Given that the first waste site database report was entitled "Phase I...", it was implied that some future action and follow up document would ensue. As a consequence, this document has been divided into two distinct parts, Phase II and Phase III.

The Phase II component of this document is intended to detail what has taken place in the year (1990-91) since the publication of the Phase I report.

Phase III consists of a prospectus for the actual structure of the toxic chemical database and a dissemination mechanism. Existing Inland Waters Directorate data, landfill data from 1989, and data entered during 1990, will be used as pilot data for an information distribution mechanism. It is hoped that this prospectus will promote discussion on the toxic chemical database within C&P.

PHASE II

1990 Data Inputs

The third recommendation of the Phase I document was to allocate resources so that other Conservation and Protection hardcopy report data could be included in the toxic chemical database. These data included surveillance information for: aldicarb, PCB, polynuclear aromatic hydrocarbons (PAH), heterocyclic aromatic compounds (HAC), dioxins and chlorinated benzenes. Table 1 summarizes the surveillance data entered by summer students in 1990. Presented are the EP publication number, the number of station locations determined and the number of distinct samples collected. Three hundred and fifty-one stations were entered from which 879 samples were identified. This was preceded by some conversion of units and assignment of temporary NAQUADAT variable codes.

TABLE 1

Surveillance Reports Entered into the Database

# of the Publication and Title	# Stations	# Samples
EPS-5-AR-87-4 Assessment of Prince Edward Island Ground Waters for the Pesticide Aldicarb	102	458
EPS-5-AR-82-2 Investigation of the Cause and Extent of PCB Contamination of Petit-de-Grat Harbour, Nova Scotia	21	30
EPS-5-AR-77-15 An Environmental Investigation of the Area Immediately Surrounding the Surrette Battery Company Limited Plant at Springhill, Nova Scotia	90	156
EPS-5-AR-86-3 Polynuclear Aromatic Hydrocarbons in the Vicinity of the Two Atlantic Region Wood Preserving Operations	30	30
EPS-5-AR-83-6 Investigation of Polynuclear Aromatic Hydrocarbon Contamination of Sydney Harbour Nova Scotia	97	154
EPS-5-AR-88-7 Polynuclear Aromatic Hydrocarbons and Heterocyclic Aromatic Compounds in Sydney Harbour, Nova Scotia. A 1986 Survey	--[a]	--[a]
EPS-5-AR-88-5 Dioxin Content In Sediments From the Vicinity of Two Wood Preserving Operations	6	6
EPS-5-AR-80-1 Chlorinated Benzenes in Herring Gull and Double-Crested Cormorant Eggs From Three Locations in The Maritime Provinces	5	45
TOTAL	351	879

[a] The two Sydney Harbour surveys were combined

The stations were entered into a station description file before the samples could be entered. To enter a station into the description file, it must have a 12 character station description which is based upon the NAQUADAT format. The first two characters refer to the media type code. The next six characters refer to the province (char. 1 and 2), basin (3 and 4) and hydrometric sub-basin (5 and 6). The sequential number (the next four characters) is a unique identifier linked with the sampling site. Latitude, longitude and a narrative description comprise the station description. Environmental samples are linked to these stations so that data may be interpreted both spatially and temporally.

Before entering sample data, certain information had to be determined and verified. Some conversion of concentration units was necessary to be consistent with NAQUADAT (i.e. $\mu g/L$ for water and mg/kg for sediments). The sampling dates were obtained or estimated and temporary variable codes assigned where none were available. The specific information required for initializing samples was: the station number; date and time of sampling; type of sample (water, sediment, etc.); variable codes and field and laboratory values (actual measurements). All of the EP Surveillance data was entered under the project identifier code 900. This Sub I.D. number, 900, will allow easier access to the data upon retrieval but more importantly provides an audit trail mechanism as the project description indicates the source or originator of the data.

In addition to the EP surveillance data there is an additional body of regional environmental data. These additional data sets complement the main chemical database because they include information on wildlife and other areas of ecological importance. The P. Lane and Associates (1986) document entitled "Risks to Migratory Birds" contains information on regional industrial point sources and migratory bird habitats in proximity to those sources. Those data too were formatted so that they

could be entered in the toxic chemical database. The Department of Public Works (DPW) maintains a computerized inventory of properties in the region. Those properties vary from navigational markers to National Parks. The DPW data set was obtained and a proposed mechanism for data acquisition was developed based upon the land-use code built into the DPW database.

During the early 1970's the International Biological Programme identified numerous areas in the Atlantic Region as candidate ecological reserves (Beardmore 1985; Davis 1988). Those locations are distinct areas of ecological significance due to flora, fauna or natural heritage. Those sites, along with National Wildlife Areas, Migratory Bird Sanctuaries and the habitats identified by P. Lane (1986), are areas that generally do not impact upon water quality but are areas that may be influenced by water quality or anthropogenic factors. For this reason, they were included in the toxic chemical database and assigned station locations and descriptions. Where available specific data were entered. Though the aforementioned data holdings do not contain actual chemical measurements, they are relevant to CEPA Part I and II.

RESULTS

As a result of activities carried out in 1989 and 1990 several geo-referenced data sets now exist within the Toxic Chemical Database. They are presented in Table 2.

TABLE 2

Data Sets Within the Toxic Chemical Database

Description	Source
NAQUADAT	Inland Waters Directorate
Abandoned Land Disposal Site	Environmental Protection and Provincial Reports
Migratory Bird Habitats	P. Lane & Associates(1986)
Ecological Reserves (Natural Heritage Areas)	Beardmore (1985) Davis (1988)
EP Surveillance Data (8 reports)	Environmental Protection
Industrial Point Sources	P. Lane & Associates(1986)
DPW Federal Properties	Department of Public Works
Migratory Bird Sanctuaries	Canadian Wildlife Service (1988)
National Wildlife Areas	Canadian Wildlife Service (1988)
Federal Facility Hazardous Waste Production	Environmental Protection

The above noted data holdings are point files which have been assigned station numbers using the NAQUADAT format with some specific modification to reflect the type of data. For example, the abandoned land disposal sites data holding is a file of 1069 distinct locations of waste sites with each site having a unique station number, description and associated data. The detail of the station description is somewhat limited by the extent of information available from the originating source. Using the database management software ORACLE, additional data specific to

the station type were entered so that all relevant information could be stored and accessed. The conversion of NAQUADAT to the ORACLE-DBMS has facilitated the input of data to NAQUADAT that was previously not possible or practical. Figure 1 is an example of an actual ORACLE screen image of a bird habitat station and illustrates the type of information stored. Each table was built dependent upon the specific data available in the P. Lane and Associates (1986)document.

FIGURE 1

ORACLE Screen Image of a Bird Habitat Station

```
+-------------------------------------------------------------------------+
|                    -------- STATIONS --------                           |
+-------------------------------------------------------------------------+
|                                                                         |
|     STATION TYPE CODE: BH   STATION NO: NS01FJ0081                      |
|                                                                         |
|     STATION NAME: BIRD HABITAT STATION                                  |
|                                                                         |
|              LATITUDE: 461014          LONGITUDE: 595616                |
|                                                                         |
|     UTM ZONE: 21     UTM EASTING: 273200      UTM NORTHING: 5117000     |
|                                                                         |
|                   CREATION DATE:  28-MAY-90                             |
|                                                                         |
+-------------------------------------------------------------------------+

+-------------------------------------------------------------------------+
|                    -------- HABITAT --------                            |
+-------------------------------------------------------------------------+
| STATION TYPE CODE: BH   STATION NO: NS01FJ0081                          |
|                                                                         |
| SOURCE:          PAT LANE & ASSOCIATES CWS 1986                         |
|                                                                         |
| HABITAT     1: NATURAL HERITAGE AREA                                    |
| DESCRIPTION 2:                                                          |
|                                                                         |
| HABITAT USE:     BIG GLACE BAY MIGRATORY BIRD SANCTUARY                 |
|                                                                         |
| STATUS:          ACTUAL                                                 |
|                                                                         |
| LOCATION:        EASTERN CAPE BRETON ISLAND                             |
|                                                                         |
| APPROX SIZE:     1.1km2                                                 |
|                                                                         |
| BIOTA TYPE:                                                             |
|                                                                         |
| SPECIES:                                                                |
+-------------------------------------------------------------------------+
```

HABITAT MEASUREMENT					
STATION NUMBER	SPECIES NAME	INDIVIDUALS	NESTS	PAIRS	COLONIES
BH NB01BJ0107	COMMON TERN			700	
BH NB01BJ0107	HERRING GUL	207			
BH NB01BJ0107	GREAT BLACK	21			
BH NB01BJ0107	RING BILLED	76			
BH NB01BJ0107	GRT.BLUE HE			50	

The abandoned waste site data, the EP surveillance data, the DPW Federal properties, the industrial point source data sets, and the federal waste production data are all relevant to CEPA. So too are the data sets that reflect areas of ecological significance. The merits of each of these pieces of data can be elucidated by those charged with delivering CEPA implementation strategies from both a chemical and biological perspective. The abandoned waste site data set, for example, while meritorious in its own right and meeting the objectives for which it was initially compiled, is of limited value as a stand alone product, but is of considerable value when it can be related to other data. This requirement to relate initially dissimilar data sets led to the formulation of a structure for the C&P toxic chemical database. This proposed structure is for discussion purposes and forms Phase III of the database development.

PHASE III
PROPOSED STRUCTURE

There are three distinct aspects of the proposed C&P toxic chemical database that must be discussed. The first is the data or information contained in the database; its nature, source, and scope. The second is the dissemination of the information contained in the database in a manner that is both concise and efficient. The third is the management of the resources to implement, operate and maintain all aspects of the database. Figure 2 summarizes these components.

Figure 2
C&P Toxic Chemical Database Components

Information Structure	Data Dissemination	Management Resources
- What data contained	- How data presented	- Who's task to disseminate and input
- How data organized	- To whom information given	- Responsibility
- Audit trails	- Frequency of dissemination	- Accountability
- Scope of data	- Formats	- Costs
- Contents		

Information Structure

Environmental scientists and resource managers currently exist in a world where they are bombarded with information both privately and professionally. The ability to seek and obtain relevant information in a timely manner permits increased effectiveness in program delivery.

In viewing C&P it is apparent that each unit has specific mandates and needs when it comes to data type, storage, and use. It is also apparent that information that one service possesses can enhance the effectiveness of another. For example, knowing where sensitive habitats or landfills are located can influence the location of water quality monitoring stations, while water chemistry data is useful to a habitat biologist studying a wetland or a CEPA inspector investigating an alleged offence. However, it can be difficult to obtain some of this information unless a specific project scientist knows of the existence and location of the relevant data.

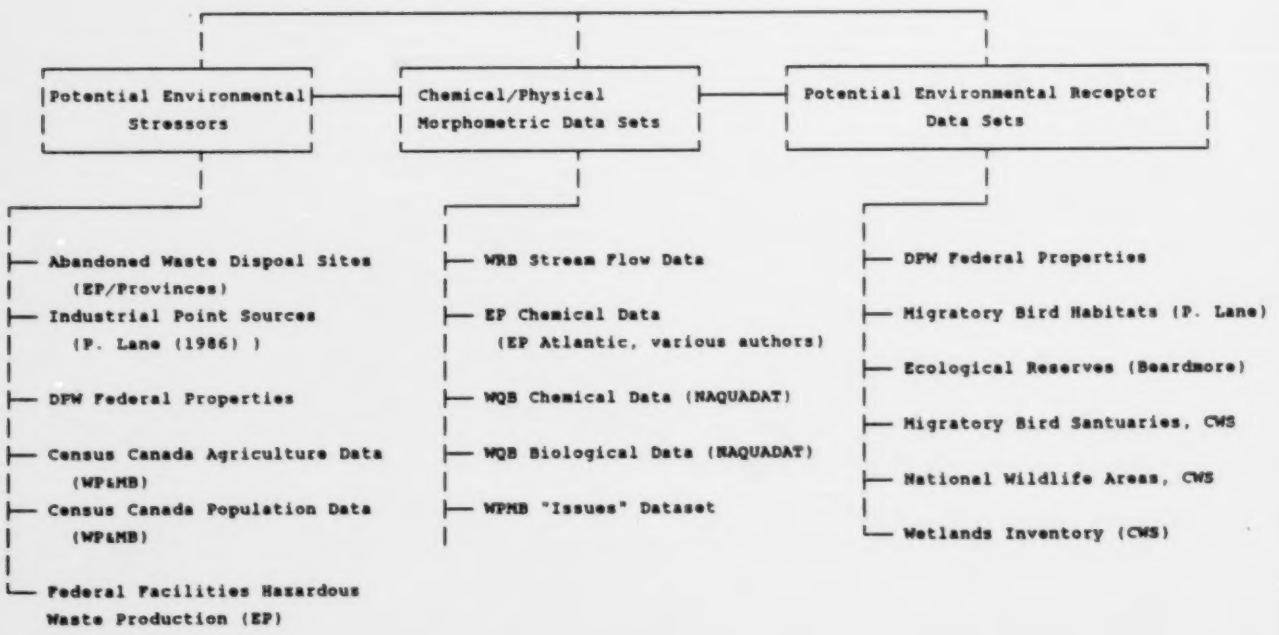
The issues facing C&P Atlantic Region include CEPA implementation and enforcement, toxic chemicals, acid rain, environmental assessments, environmental effects monitoring, state of the environment reporting, federal-provincial agreements and wildlife protection. Thus it is advantageous for any toxic chemical database within C&P to be flexible and broad in nature.

While the Phase I document stressed the use of the toxic chemical database within CEPA, further analysis has indicated that such a database is also of value to SOE, EARP, and EEM. Therefore, the proposed database structure will be viewed from a broad (value added) scope while at the same time keeping a focus targeted towards CEPA.

The following proposed data structure has been prepared primarily from the IWD perspective with minimal input from other

services. It has been presented in-house and at a recent environmental effects workshop in Regina as a concept. It should be viewed as a proposal that is subject to modifications. As a result of this prospectus, input from others within C&P is expected which will result in changes and improvements to the proposed database structure. The cornerstone of the database is NAQUADAT. Over 1.2 million chemical measurements in the regional system make it the largest segment of data. As a consequence, full compatibility with NAQUADAT is mandatory. Figure 3 illustrates the basic proposed structure of the database and where the various data sets fit into the scheme.

FIGURE 3
Proposed Data Structure


Potential Environmental Stressors
Chemical/Physical Morphometric Data Sets
Potential Environmental Receptor Data Sets
Abandoned Waste Disposal Sites (EP/Provinces)
Industrial Point Sources (P. Lane (1986))
DPW Federal Properties
Census Canada Agriculture Data (WP&MB)
Census Canada Population Data (WP&MB)
Federal Facilities Hazardous Waste Production (EP)
WRB Stream Flow Data
EP Chemical Data (EP Atlantic, various authors)
WQB Chemical Data (NAQUADAT)
WQB Biological Data (NAQUADAT)
WPMB "Issues" Dataset
DPW Federal Properties
Migratory Bird Habitats (P. Lane)
Ecological Reserves (Beardmore)
Migratory Bird Santuaries, CWS
National Wildlife Areas, CWS
Wetlands Inventory (CWS)

At the uppermost level, three data types are proposed: potential environmental stressors, chemical/physical/morphometric /demographic data, and potential environmental receptor areas. The principal mechanism by which the database can be linked becomes the latitude and longitude of distinct data locations. The station description of NAQUADAT has been adopted as the model for any site that falls within any of these data sets or future data sets. Thus the data contained is amenable to GIS input and interpretation.

The Potential Environmental Stressors cluster contains data sets of sites or areas which could exert a stress upon the environment (land fills, industry), or data sets where potential impacts can be assumed (Stats Can. Agricultural data, DPW Federal Properties, Census Canada population data). The Statistics Canada data set contains not only population data, but also water use data, pesticide purchase data and land use information.

Conversely the Potential Receptor data sets are identifiable areas that may be influenced by anthropogenic activities. Several of those sites are on federal properties, such as National Parks, or are federally administered, such as migratory bird sanctuaries and National Wildlife Areas. Ecological reserves and candidate reserves Beardmore (1985) are included due to the significant diversity of their flora and fauna. These areas were also assigned NAQUADAT station descriptions and entered on the regional station file. As several sites are large in area, an area field was included so that the scope of a site could be more accurately described by any GIS interpretation.

The third, and most extensive element, is data of a chemical, physical, morphometric and demographic nature. As noted before, the NAQUADAT data base contains in excess of 1.2 million chemical measurements. The data include water, sediment and biota measurements for various parameters, as well as data entered from EP surveillance reports and data obtained from

external sources such as DFO, CWS, and the provinces. The Water Quality Branch of IWD has recently completed a data structure for the Water Planning & Management Branch known as the "Issues" database. This database will provide storage and ad hoc query capability for environment-related newspaper articles. Data can be accessed geographically by province or sub-basin as well as by keywords. This may be a logical inclusion into the proposed structure.

At this time the entire NAQUADAT system is undergoing a major conversion to the ORACLE database management system. This conversion will greatly enhance the storage capability of NAQUADAT. Once the ORACLE conversion is complete, NAQUADAT will be able to accommodate other types of data sets such as groundwater supply data. NAQUADAT is currently being proposed as the vehicle to store environmental effects monitoring data collected under the revised pulp and paper regulations of the Fisheries Act. Chemical data can be used to indicate whether or not potential stressors have had an influence on the environment. Chemical/physical measurements are also required to characterize areas of ecological significance.

It is also anticipated that those scientists, engineers, and managers who access data will have at their disposal the tools to interpret the data. Those working in a PC environment might have different statistical and graphical software from those working with a larger VAX-VMS system. Professional judgement and expertise will still dictate how data is manipulated and interpreted. A large amount of data will be accessed on a read-only basis. That is, an individual may access the data inside the database, may retrieve a subset of the data and manipulate the subset, but may not edit or alter the base data set. This is done to protect the integrity of the data. The only exceptions may be where a specific individual is responsible for updating a dynamic data set subject to frequent changes.

Care must be taken in determining which data sets are actually entered into the system. To avoid duplication of effort only those data sets relevant to C&P and the scope of the database should be included, if they do not exist on a readily accessible electronic system. Several data sets may exist on floppy diskettes to which only a few people have access. Some of these data sets may be of benefit to others within C&P while others may be protected. Where electronic databases already exist, electronic linkages should be explored so that data available within C&P and from outside agencies can be exchanged. Where electronic access to these data is not possible or permitted, an information list containing such items as data type, agency, contact person, media availability, cost, and so on should be provided.

By using the ORACLE relational database various data sets or objects may be linked to each other. It is intended that the station file, and specifically the latitude and longitude, will be the principle linking mechanism for the objects. The use of GIS has increased within Environment Canada with several services now having GIS software on site. As a consequence data now exist in the form of thematic maps, such as those indicating pesticide input potential (O'Neill and Howell, 1990).

Several thematic maps have been developed that describe land capability, land use, watershed areas, major streams, and transportation corridors. These types of data must also be included in the database. This necessitates that the "front-end" or access point to the database should have GIS compatibility so that both thematic areal information and point data may be simultaneously viewed and extracted. Several GIS systems are currently being evaluated for their ability to serve this function.

Dissemination Structure

An essential aspect of any database system is the dissemination of information contained in the database. Input of data will be the responsibility of managers tasked with program delivery. Usually the input mechanism entails the receipt of data either in hard copy or electronic format, its validation, interpretation, and storage or archiving. In programs such as Ocean Dumping, Water Quality Monitoring, and Hydrometric Networks, these mechanisms exist. Therefore this prospectus will deal with disseminating the data/information to as wide an audience as possible. The anticipated audience encompasses managers who would have informational and summary requirements, environmental scientists who would require interpretive access and database managers who would be responsible for managing and interpreting large volumes of data. Thus, a multi-level or tier approach is proposed to disseminate information. Figure 4 illustrates a mechanism by which such data could be disseminated.

FIGURE 4

INFORMATION DISSEMINATION MECHANISMS

TIER

	TIER 1 Managers Layer	TIER 2 Technical Selection Layer	TIER 3 Interpretive Layer
USERS	Managers Scientists Engineers Data Interpreters OGDs	Scientists Engineers Data Interpreters Environmental Analysts	EDP Personnel Trained and experienced scientists and Data Interpreters
PURPOSE	Information Preliminary Project Planning (Snapshot)	Minor Interpretation of selected data	Major interpretation Spatial/temporal analysis Archiving of raw data Integrity of database
LEVEL OF DATA COMPLEXITY	Summary Data Program Info Narrative (Diskette)	Subset of matched data Map information Graphical info	Complex Raw Data All project data, QA/QC, etc. Database location
EASE OF USE	User Friendly	Informed but not expert Specific software knowledge (SPANS)	Must be experienced EDP personnel
SIZE OF MACHINE	PC (286) 20-40 meg	Work Station with enhanced graphs & memory (PC-WS) Unix/windows Math Co-Processor Dual Screens Colour hard copy, etc.	Large VMS systems Full software and hardware capabilities Security major factor

	TIER 1 Managers Layer	TIER 2 Technical Selection Layer	TIER 3 Interpretive Layer
DOES MECHANISM EXIST	No	Somewhat within some services (WQB) (WRB) (EP)	Yes (WRB) (WQB) (Ocean Dumping)
MANAGERS AND $$ IN EXISTENCE	No	Somewhat	Yes
SOURCE OF INFORMATION INPUTS	Single Source Cleaning House to format and distribute To be developed	Retrieved from (3) Outside agencies Derived	In house From project studies From other computers Lab instruments to computers Other agencies
SOURCE MECHANISM	To be developed	Exists within programs	Exists within programs

Presented are three distinct tiers of information type and access. Tier 1 represents an informational, summary, user friendly type of data package to provide a quick overview of the data available, its format, contact person and perhaps an example. A low cost GIS-based system would be the preferred mechanism. An engineer for example could find out the kind of data that exists with respect to a chemical and where to obtain more detailed data.

Tier 2 exists to an extent within some operational units. At this level, data would be retrieved from any number of potential sources and subject to interpretation (eg. A SPANS-GIS analysis of point and areal data). A PC work station would be

the minimum requirement and some software/computer knowledge would be required of the user. Only database subsets or copies of databases would exist in this environment. The main bulk of any database would reside at Tier 3.

Tier 3 would be the archival repository for data. Only trained experienced personnel would have access at this level due to the complexity of the data, its magnitude and the need to preserve data integrity. Such systems already exist within the WQB and WRB of IWD. Complex data analysis would take place in such an environment.

For example, approximately 60,000 cadmium results for water, sediment and biota reside on the WQB VAX (Tier 3). An aquatic scientist might download only a portion (eg. water from Cape Breton lakes) to a work station (Tier 2) for SPANS analysis and interpretation. The Tier 1 information floppy disc might indicate that there were several hundred stations where cadmium was measured or that there are 60,000 measurements on file at WQB. Perhaps an engineer tasked with developing site remediation criteria might wish to select a site for a pilot study. The Tier 1 disk might indicate that a database exists at IWD, a sample is presented and it is also noted that there are 1069 sites in Atlantic Canada. If the engineer was only interested in Priority I sites within 100 m of surface water, an enquiry could be made of a contact person or, if the engineer was experienced and at a PC work station, the data could be obtained directly from the main database. Thus only 20 sites of the 1069 would be downloaded.

Under such a multi-level system, managers and scientists can be informed as to the data available without having to view it in its entirety and, should the data be of value within a specific project, it could be obtained from the source database.

Distinctions between the tiers can be difficult to ascertain in some work places due to the amount of existing resident computer hardware and expertise. As stated earlier, Tier 2 and 3 systems already exist within some units. No integrated informational type of data summary is available so that environmental scientists, data interpreters and managers can rapidly determine what information is available. The task will be to develop a mechanism by which Tier 1 is implemented within C&P and to enhance some service units so that they have Tier 2 capabilities.

In addition, the agency responsible for assembling data summaries for distribution and the resource requirements to do same will have to be determined.

In a co-operative effort with IWD-Headquarters, IWD-Atlantic Region is exploring the use of a low-cost front end GIS package to access data within NAQUADAT. This system will use the data contained in the toxic chemical database. The successful completion of this effort should result in a product that will make environmental data more accessible and more easily distributed. Thus, the Tier 1 objective of providing informational data so that managers, and scientists can be better informed as to data availability will be met.

RECOMMENDATIONS

1. The Inland Waters Directorate has made a commitment to CEPA implementation by developing, with resourcing, a toxic chemical database that can serve parts I and II of CEPA. Each individual tasked with the delivery of the various parts of CEPA will develop where appropriate, (or currently possesses) a database to meet his/her specific needs and mandates. It is recommended that, as regional CEPA delivery has been assigned to the RTCC, the RTCC should ensure that the databases that evolve are focussed, compatible and non-duplicative.

2. The advantages that have been proposed will not be possible until the full conversion of NAQUADAT to ORACLE has occurred. Until this conversion is complete, it would be counterproductive to attempt to broaden the scope of the toxic chemical database. It is recommended that, for the present, the toxic chemical database should maintain a scope within IWD program delivery and CEPA implementation strategies (Part I and II) so that the aforementioned conversion may proceed.

3. The various service units within C & P - Atlantic should be made aware of the toxic chemical database. This will allow them to ascertain its value and to determine the levels of commitment required to input, access and so on. This would permit those in the process of developing databases to avoid the pitfalls encountered by Water Quality Branch in its 20 year history with NAQUADAT. It is recommended that, under the aegis of the RTCC, IWD should present examples of the database products to various groups within C&P-Atlantic Region.

4. To date student resources have been the principle means of support but the actual implementation of a service-wide database will require increased A-Base commitments, without which the proposed advantages cannot be realized. It is recommended that management commit the human and financial resources necessary to build, operate, and maintain the toxic chemical database and dissemination mechanism.

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